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ABSTRACT

This Technical Committee Report prepared by industry representatives in Idaho lists the skills currently necessary for an employee in that state to obtain a job in applied welding technology, retain a job once hired, and advance in that occupational field. (Task lists are grouped according to duty areas generally used in industry settings, and are used as the basis for modules in the statewide curriculum guide development process and for generating student profiles.) The first section of the guide is the task profile, which provides the Idaho code number for the occupation and outlines major concepts/content, laboratory activities, teaching considerations, and intended outcomes. The guide then lists the following 10 task areas with subtasks (competencies) for applied welding technology: employability skills; general safety skills; basic trade skills; oxyacetylene welding; oxy-fuel cutting; shielded metal arc welding; gas tungsten arc welding; gas metal arc and flux cored arc welding; carbon arc cutting; and plasma arc cutting. (KC)

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TECHNICAL COMMITTEE REPORT FOR

APPLIED WELDING TECHNOLOGY

Invest in Success

IDAHO VTE VOCATIONAL TECHNICAL EDUCATION

STATE DIVISION OF VOCATIONAL EDUCATION

1990

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INTRODUCTION

The curriculum development process undertaken by the Idaho Division of Vocational Education involves the active use of industry personnel. Industry personnel comprise the sole membership on Technical Committees which are responsible for the development of Task Lists for each program. A Technical Committee Report is prepared on completion of the Committee's assignment. This publication is the Technical Committee Report.

The Task List prepared in the Technical Committee Report reflect the current trends and skills necessary for an employee to: 1) Obtain a job in Idaho's industry, 2) retain a job once hired, and, 3) to advance in the occupational field. Task Lists are grouped according to Duty areas generally used in industry settings. Duty areas are used as the basis for modules in the Statewide Curriculum Guide development process. The Technical Committee segment is the single most significant step in the curriculum development process. All future curriculum activities are predicated on the premise that an accurate picture of industry needs are reflected in the Task List.

Instructional personnel are selected to develop the Statewide Curriculum Guide. These instructors write Performance Objectives for each Task and the subsequent Enabling Objectives for each Performance Objective. The committee members prepare all material in a competency-based format so as to have an effective and efficient methodology for determining student progress. The Statewide Guides are designed as the prime determiner of program content. All programs must follow the established Guide in order to be approved for operation. Any deviation from this Guide requires written approval from the respective program supervisor at the Division of Vocational Education. It is not the intent of the Division that all programs be designed to be exactly the same, but assurance is needed to ensure that the program meets the minimum standards for operation, based on the community needs, equipment, and facilities available to the local school or institution.

The Technical Committee Report does not dictate the level of instruction The Task List developed represents the entire occupational field. Schools and Institutions determine what skills can be taught and what depth of instruction can be provided. They must choose the Tasks to be taught from the Technical Committee Report but are free to determine how many or which ones can be incorporated into their program.

The Technical Committee Report is also used as the primary list for generating Student Profiles. These Profiles are used as a cumulative record of each student's progress. They are printed in a folder format and have levels of performance scales for each Task so that student competence can be recorded for individual skills or tasks. This document will become the main component for Articulation activities in the event that the student desires to go on for additional training or education.

ACKNOWLEDGEMENTS

The Technical Committee process involves personnel from industry who are selected by the Division with assistance from the State Council on Vocational Education. People who serve on the Committees are nominated by local administrators. They generally come from local advisory committees for existing Vocational Education programs or are community representatives in a capacity to provide the necessary information about industry needs. These people serve with the approval of their employers and give their time and energy to the project without cost. The Division provides reimbursement for per diem and travel. We are indebted greatly to these industry representatives and to their employers for the resources so freely given to the pursuit of ensuring that Idaho students receive the most current training and education possible and that which is demanded by industry.

To this end, the Division recognizes the following people who served on the Welding Committee Technical Committee: George Sheets, Idaho Falls; Andy Anderson, Boise; Neil Hepworth, Idaho Falls; Robert Mahoney, Idaho Falls; John Cooley, Boise; and Berry Bloom, Boise.

Your support and assistance was very greatly appreciated. Your patience for enduring the educational process is also noted. The students and instructional staff will be much more able to accomplish their respective goals as a result of your contributions.

Sho Ueda, Supervisor
Trade and Industry

Don Eshelby
Director of Program Services

TASK PROFILE

IDAHO CURRICULUM FRAMEWORK **PROGRAM AREA: Trade & Industrial**

PROGRAM TITLE: Applied Welding Technology **EFFECTIVE DATE: June, 1990**

IDAHO CODE NUMBER: 6236 **CIP 48.0508**

I. **MAJOR CONCEPTS/CONTENT: The purpose of this program is to prepare students for employment as welders and flame cutters (Division 81), tack welders (810.684-010), welder assemblers (819.381.010), welder helpers (819.687-014), combination welders (819.384.010), arc cutters (816.384-010), arc welders (810.384-014), combination welders (819.384-010), production line welders (819.684-010), or to provide supplemental training for persons previously or currently employed in these occupations.**

The content includes, but is not limited to, communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, use of blueprints and shop drawing, use of gases and/or welding processes and brazing parts according to diagrams, blueprints or written specifications.

II. **LABORATORY ACTIVITIES: Shop or laboratory activities are an integral part of this program and provide instruction in various processes and techniques of welding and fabrication skills, including oxyacetylene welding and cutting (OAW), brazing, arc welding (SMAW), MIG welding (GMAW), flux core arc welding (FCAW), TIG welding (GTAW), certification test preparation, and use of current industry standards and techniques.**

III. **SPECIAL NOTE: The Vocational Industrial Clubs of America, Inc. is an appropriate vocational student organization for providing leadership training experiences and reinforcing specific vocational skills. When provided, these activities are considered an integral part of this instructional program.**

The cooperative method of instruction may be utilized for this program. Whenever the cooperative method is offered, the following is required for each student: a training plan, signed by the student, teacher and employer, which includes instructional objectives and a list of on-the-job and in-school learning experiences; a work station that reflects equipment, skills and tasks relevant to the occupation the student has chosen as a career goal.

The typical length of this program for the average-achieving student at the post-secondary level is 1200 to 1400 hours for a certificate and 2000 to 2250 hours for an A.A.S. degree. The average length for secondary students is 900 hours with multi period blocks of instruction provided to accomplish a major portion of the listed competencies.

IV. **INTENDED OUTCOMES: After successfully completing this program, the student will be able to:**

01. Demonstrate employability skills.
02. Demonstrate general safety skills.
03. Apply basic trade skills.
04. Apply oxyacetylene welding skills.
05. Apply oxy-fuel cutting skills.
06. Apply shielded metal arc welding skills (SMAW).
07. Apply gas tungsten arc welding skills (GTAW).
08. Apply gas metal and flux core welding skills (GMAW)(FCAW).
09. Apply carbon arc cutting skills.
10. Apply plasma arc cutting skills.

- INSTRUCTIONAL LEVEL CODE -

NOTE: The letter key in the task listing is as follows:
LEVEL

E = Entry level skill - denotes basic instructional content necessary to enter job market.
R = Retention level skill - denotes instructional content needed to retain the job.
A = Advanced vocational education level skill - denotes skill training for job retention and promotability.

TASK LISTING

STUDENT PERFORMANCE STANDARDS EFFECTIVE DATE: June 1990

PROGRAM AREA: Applied Welding Technology

01.0 EMPLOYABILITY SKILLS

The student will be able to:

LEVEL		
E	01.01	Identify employment opportunities.
E	01.02	Apply employment-seeking skills.
E	01.03	Interpret employment capabilities.
E	01.04	Demonstrate appropriate work behavior.
E	01.05	Maintain safe and healthy environment.
E	01.06	Maintain a business-like image.
E	01.07	Maintain working relationship with others.
E	01.08	Communicate on the job.
E	01.09	Adapt to change.
E	01.10	Demonstrate a knowledge of business.
E	01.11	Perform mathematical skills.

02.0 DEMONSTRATE GENERAL SAFETY SKILLS

The student will be able to:

LEVEL		
E	02.01	Identify the use and purpose of the safety equipment required for any assigned procedure or operation, i.e., ear plugs.
E	02.02	Set up and maintain a safe working environment for all assigned procedures or operations.
E	02.03	Demonstrate safe operation of a disc grinder.
E	02.04	Demonstrate safe operation of a bench grinder.
E	02.05	Demonstrate safe operation of a cut off saw.
E	02.06	Demonstrate safe operation of a band saw.
R	02.07	Demonstrate safe operation of a hydraulic shear, punch, brake, and roll.
E	02.08	Demonstrate safe operation of a drill press.
E	02.09	Demonstrate safe operation of common hand tools.

03.0 APPLY BASIC TRADE SKILLS

The student will be able to:

LEVEL		
R	03.01	**Interpret detail drawings.**
E	03.02	**List materials for fabrication from blueprints.**
E	03.03	**Identify fabrication materials.**
E	03.04	**Identify metals by appearance, weight, and magnetic properties.**
E	03.05	**Identify metals by spark test.**
E	03.06	**Apply cutting skills.**
R	03.07	**Apply bending skills.**
E	03.08	**Apply drilling skills.**
E	03.09	**Apply punching skills.**
R	03.10	**Apply finishing skills.**
R	03.11	**Apply rolling skills.**
E	03.12	**Demonstrate proper tip cleaning procedures.**
E	03.13	**Demonstrate proper regulator adjustment.**
R	03.14	**Use technical manuals and references.**
R	03.15	**Demonstrate use of layout tools.**
E	03.16	**Maintain a clean, well-organized work area.**
E	03.17	**Identify basic weld symbols.**
E	03.18	**Identify major welding procedures/processes.**

04.0 OXYACETYLENE WELDING

The student will be able to:

LEVEL		
E	04.01	**Set up an oxyacetylene station.**
E	04.02	**Light and adjust torches.**
E	04.03	**Puddle mild steel plate without filler.**
E	04.04	**Pad mild steel plate with filler, flat position.**
E	04.05	**Weld T-joint in the flat position (1-F) with filler.**
E	04.06	**Weld lap joint in the flat position (1-F).**
E	04.07	**Weld corner joint in the flat position (1-F).**
E	04.08	**Weld butt joint in the flat position (1-G).**
R	04.09	**Deposit weld beads in the horizontal position.**
R	04.10	**Weld a T-joint in the horizontal position (2-F).**
R	04.11	**Weld a lap joint in the horizontal position (2-F).**
R	04.12	**Weld a corner joint in the horizontal position (2-F).**
R	04.13	**Weld a butt joint in the horizontal position (2-G).**
R	04.14	**Deposit weld beads in the vertical position.**
A	04.15	**Weld a T-joint in the vertical position (3-F).**
A	04.16	**Weld a lap joint in the vertical position (3-F).**
A	04.17	**Weld a corner joint in the vertical position 3-F).**
A	04.18	**Weld a butt joint in the vertical position (3-G).**
A	04.19	**Deposit weld beads in the overhead position.**
A	04.20	**Weld a T-joint in the overhead position (4-F).**
A	04.21	**Weld a lap joint in the overhead position (4-F).**
A	04.22	**Weld a corner joint in the overhead position (4-F).**

A	04.23	**Weld a butt joint in the overhead position (4-G).**
A	04.24	**Weld pipe in the flat position (1-G).**
A	04.25	**Weld pipe in the 2-G, 5-G, and 6-G positions.**
E	04.26	**Braze mild steel.**
A	04.27	**Braze cast iron.**
E	04.28	**Braze copper.**
E	04.29	**Silver braze copper pipe joints.**
E	04.30	**Soft solder copper joints**
A	04.31	**Braze cast iron to mild steel.**
R	04.32	**Oxyacetylene weld/braze aluminum.**
R	04.33	**Hardsurface weld with oxyacetylene welding equipment.**

05.0 OXY-FUEL CUTTING

The student will be able to:

LEVEL		
E	05.01	**Set up an oxyacetylene station.**
E	05.02	**Light and adjust torches.**
E	05.03	**Lay out and cut straight line (manual).**
E	05.04	**Lay out and cut bevels (manual).**
E	05.05	**Lay out and cut circles.**
E	05.06	**Lay out and cut patterns.**
R	05.07	**Lay out and cut structural shapes, beams, angle, and channel iron.**
A	05.08	**Lay out and cut pipe.**
R	05.09	**Lay out and cut square and round solid stock (manual).**
E	05.10	**Lay out and straight line cut (machine).**
E	05.11	**Lay out and bevel cut mild steel plates (machine).**
R	05.12	**Lay out and stack cut mild steel plates (machine).**
R	05.13	**Discuss heat distortion and preheating apparatus.**

06.0 SHIELDED METAL ARC WELDING

The student will be able to:

LEVEL		
E	06.01	**Set up and adjust a shielded metal arc welder.**
E	06.02	**Identify and select electrodes.**
E	06.03	**Strike, maintain, and restart an arc.**
E	06.04	**Weld straight bead in flat position.**
E	06.05	**Weld weave bead patterns.**
E	06.06	**Weld build up pads.**
E	06.07	**Weld butt joint on plate in flat position.**
E	06.08	**Weld lap joint in flat position (1-F).**
E	06.09	**Weld T-joints in flat, horizontal, vertical and overhead positions (1-F to 4-F).**
R	06.10	**Weld lap joint.**
R	06.11	**Weld outside corner joint in all positions (1-F through 4-F).**
A	06.12	**Weld basic joints in overhead positions (4-G and 4-F).**
R	06.13	**Weld butt joint in horizontal position (2-G).**
A	06.14	**Weld single V groove in all positions (1-G through 4-G).**

A	06.15	**Weld pipe joints in all positions.**
E	06.16	**Plug and slot welds.**
A	06.17	**Weld light gauge sheet metal (1-G through 4-G and 1-F through 4-F).**
A	06.18	**Weld cast iron.**
A	06.19	**Weld alloy steels.**
E	06.20	**Build up a shaft or round surface.**
E	06.21	**Weld aluminum.**
R	06.22	**Cut metals with SMAW.**
R	06.23	**Hard-surface metals with SMAW.**

07.0 GAS TUNGSTEN ARC WELDING

The student will be able to:

LEVEL		
E	07.01	**Set up gas tungsten arc welder.**
E	07.02	**Select and prepare proper tungsten electrode.**
E	07.03	**Strike an arc.**
R	07.04	**Weld lap joint mild steel in all positions (1-F through 4-F).**
R	07.05	**Weld corner joint mild steel in all positions (1-F through 4-F).**
R	07.06	**Weld T-joint mild steel in all positions (1-F through 4-F).**
R	07.07	**Weld butt joint mild steel in all positions (1-G through 4-G).**
R	07.08	**Weld butt joint stainless steel in all positions (1-G through 4-G).**
R	07.09	**Weld lap joint stainless steel in all positions (1-F through 4-F).**
R	07.10	**Weld corner joint stainless steel in all positions (1-F thorugh 4-F).**
R	07.11	**Weld T-joint stainless steel in all positions (1-F through 4-F).**
A	07.12	**Weld butt joints on aluminum in all positions (1-G through 4-G).**
A	07.13	**Weld lap joint on aluminum in all positions (1-F through 4-F).**
A	07.14	**Weld T-joint on aluminum in all positions (1-F through 4-F).**
R	07.15	**Weld corner joint on aluminum in all positions (1-F through 4-F).**
A	07.16	**Pipe welding in all positions (1-G, 2-G, 5-G and 6-G)**

08.0 GAS METAL ARC AND FLUX CORED ARC WELDING

The student will be able to:

LEVEL		
E	08.01	**Set up and adjust GMAW and FCAW equipment.**
E	08.02	**Weld weave bead patterns.**
A	08.03	**Weld butt joints in all positions (1-G through 4-G).**
R	08.04	**Weld lap joints in all positions (1-F through 4-F).**
R	08.05	**Weld corner joints in all positions (1-F through 4-F).**
R	08.06	**Weld T-joints in all positions (1-F through 4-F).**
A	08.07	**Weld aluminum plate (1-F through 4-F and 1-G through 4-G).**
A	08.08	**Weld stainless steel (1-F through 4-F and 1-G through 4-G).**
A	08.09	**Weld pipe in 1-G, 2-G, 5-G and 6-G positions.**
R	08.10	**Explain procedure for hardsurfacing with GMAW.**

09.0 CARBON ARC CUTTING

The student will be able to:

LEVEL		
E	09.01	Set up carbon arc cutting equipment.
E	09.02	Gouge, cut, and pierce metals.

10.0 PLASMA ARC CUTTING (PAC)

The student will be able to:

LEVEL		
E	10.01	Set up plasma arc cutting equipment.
E	10.02	Cut bevels and straight cuts on ferrous and nonferrous metals.

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